DOCUMENT RESUME

ED 136 151 CG 011 191

AUTHOR Englander-Golden, Paula; And Others
TITLE Intellectual Performance as a Function of Repression and Menstrual Cycle.
PUB DATE 4 Sep 76
NOTE 19p.; Paper presented at the Annual Convention of the American Psychological Association (84th, Washington, D.C. September 3-7, 1976)

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS College Students; *Females; *learning; Low Achievement Factors; *Performance Factors; *Physiology; Research Projects; *Sex Differences; Womens Studies

ABSTRACT

Performance on complex (Space Relations and Verbal Reasoning) and simple (Digit Symbol) tests was investigated as a function of Byrne's Repression-Sensitization (RS) dimension, phase of menstrual cycle and premenstrual-menstrual (PM) symptomatology in a group of females not taking oral contraceptives. Two control groups, consisting of males and females taking oral contraceptives, were included. Equivalent tests were given at tw sessions two weeks apart. Analysis of the Space Relations Test as a function of menstrual phase and Repression-Sensitization indicated the predicted interaction effect of phase by RS with poorest performance for the menstruating repressor group (p.02), but the predicted deterioration by the premenstrual repressor group was not observed. Similar analysis for the Verbal Reasoning Test yielded an interaction effect of phase by RS (P.03) and a main effect for phase (p.05). As predicted, differences on the Digit Symbol test did not reach significance. Substituting PM symptomatology for RS, a significant effect was obtained only for phase on the Verbal Reasoning Test (p.05). Results were interpreted as indicating a reactive nature of repression, so that during menstruation, repression may interfere particularly with performance on complex tasks. The three subject groups did not differ significantly on any of the three tests; however, trends in the present data corroborated those quoted in the literature. (Author)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED136151

Intellectual Performance as a Function of Repression and Menstrual Cycle

Paula Englander-Golden
University of Oklahoma

Keith A. Willis and Richard A. Dienstbier
University of Nebraska-Lincoln

Running Head: Performance, Repression and Menstrual Cycle

Paper presented at the Annual Convention of the American Psychological Association

Washington, D.C.

September 4, 1976

CG011191

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Intellectual Performance as a Function of Repression and Menstrual Cycle

The area of sex differences in intellectual functioning has been extensively reviewed (1,2,3). From these reviews one can identify two major issues on which there is as yet little agreement. The controversy over etiology involves a genetic-hormonal versus a social learning position taken with respect to causal factors underlying observed sex differences in intellectual performance. The other issue questions whether males excel in performance involving visual-spatial information processing or on any complex restructuring tasks as compared to females.

Theories based on genetic or hormonal etiology lead to the hypothesis that there are pervasive, stable sex differences in intellectual functioning which consistently favor males in performance of complex restructuring tasks (2, 4). At least one of the "hormonal" theories (4) suggests that females will be consistently better than males on simple, repetitive tasks. Theories based on social learning stress that observed sex differences are determined by early learning opportunities and by the emotional aspects of the child's environment, both of which differ for boys and girls in our society. Both types of theories, although using different explanatory constructs, predict stable sex differences in intellectual functioning.

The present authors hypothesize that sex differences between males and females of menstruating age, such as those found on the Differential Aptitude Tests (5), could be due to a subgroup of women whose performance varies as a function of the menstrual cycle. It was felt that hypotheses of pervasive, stable sex differences

in intellectual performance would be considerably weakened if one could identify a subgroup of females, with some special physiological and/or psychological characteristics, who perform poorly on a complex spatial restructuring test only during some part of the menstrual cycle. Consistent with that literature, such a subgroup of women was not predicted to show a large fluctuation in performance on a complex verbal test or a simple repetitive test as a function of the menstrual cycle.

Existing research on intellectual performance as a function of the menstrual cycle appears contradictory. Parlee (6) and Sommer (7) summarized results some of which show such a functional relationship, others that do not. Sommer's research shows no main effects of menstrual cycle on intellectual performance as measured on the Watson-Glaser test (8). It is important to note that hypotheses developed for the present research pertain to interaction effects rather than to main effects.

The Space Relations and the Verbal Reasoning Tests of the Differential Aptitude Tests (5) were chosen as measures of complex spatial restructuring and of complex verbal skills, respectively. Bennett et al. (5) have shown sex differences on these tests, and they have been described by other reviewers (2) as appropriate measures of such complex skills. That is, the Verbal Reasoning Test is a measure of the ability to abstract, think constructively, and indicates a relatively complex reasoning process in words. On the other hand, the Space Relations Test measures the ability to deal with concrete materials through visualization and requires mental manipulations of objects in three-dimensional space. The Digit Symbol Subtest, taken from the WAIS (9) was taken as an example of a simple repetitive task (4).

It was hypothesized that women not taking oral contraceptives who were identified as repressors on Byrne's (10) Repression-Sensitization scale would suffer a deterioration in performance on the Space Relations Test during the premenstrual and menstrual phases as compared to mid cycle. Furthermore it was hypothesized that women not taking oral contraceptives who scored high on a premenstrual-menstrual symptomatology questionnaire (11) would suffer a deterioration in performance on the above test during the premenstrual and menstrual phases of the menstrual cycle. No variability in performance was predicted on either the Verbal Reasoning Test or the simple test.

The hypotheses were based on several considerations. Studies by Witkin and his collaborators (12) suggested to the present authors that the onset of menstruation may be partly responsible for the sex differences in field independence and other intellectual skill areas for the following reasons: For those women high on premenstrual-menstrual symptomatology who suffer from headaches or cramps, intellectual performance would deteriorate premenstrually or menstrually due to the distraction and stress caused directly by those symptoms, or more indirectly, due to learned emotional responses to those symptoms.[1] Such feelings of stress or threat when coupled with a repressive defensive style, could have detrimental effects on intellectual performance by triggering repressive defense mechanisms. It is important to realize that in this hypothesis, respression as measured on the R-S scale is considered to be reactive, i.e. actively engaged mainly under conditions that elicit threat or negative

[1] Falling or low levels of progesterone and/or estrogen premenstrually and menstrually have been implicated in the cyclical variability of moods such as depression and tension (13, 14, 15).

affect.[2] This conceptualization of repression is similar to Spielberger's (17) reactive conceptualization of anxiety (as measured on the Taylor Manifest Anxiety Scale) and leads to the present assumption that female repressors would suffer a significant deterioration in intellectual performance only during the premenstrual-menstrual phases of the menstrual cycle.

The hypothesized deterioration in intellectual performance was limited mainly to spatial tasks not only because sex differences on the Verbal Reasoning Test are reported to be smaller than on the Space Relations Test (5) but also due to results reported by Holzman and Gardner (18) and Messick (19). The former authors reported that subjects who relied chiefly on repression as a defense mechanism used leveling as a prominent mode of cognitive functioning. Leveling was measured with a visual task. In a paper on the impact of negative affect on cognition, Messick (19) reported that the major effect was on tests of hidden patterns and hidden pictures. These are again visual tasks hypothesized to measure flexibility of closure and are related to the Witkin et al. (12, 20) measures of field dependence-independence (19)

A male control group was included to determine whether the traditional sex differences quoted in the literature would be obtained. Females taking oral contraceptives were considered separately from females not taking oral contraceptives, since there is some evidence that oral contraceptives have an effect on perception (21) and that females who take them perform better

[2] An extensive review of both theoretical and experimental issues pertaining to the RS scale can be found in Lazarus, et al. (16). It is quite possible that the RS scale is measuring simply one's willingness to engage anxiety evoking material.

on some intellectual tests (7).

METHOD

Subjects

Subjects were introductory psychology students who agreed to participate in this research rather than to fulfill their research requirements in other ways. Females were selected at random, i.e. by social security number, males by sign-up. Twenty-five males and 84 females participated; it was later determined that only 55 females were not taking oral contraceptive pills. Twenty-three females were taking oral contraceptives.

Procedure

At the beginning of the semester the subjects were asked to fill out Byrne's (10)RS scale and return for two experimental sessions separated by 2 weeks.

Subjects appeared in the experimental sessions in groups of 6 to 15. A female experimenter was assigned to the female groups and a male to the male groups. At the first session, the experimenter stated that the tests were part of a study investigating mood and performance. A mood adjective check list was given, immediately followed by the Space Relations Test, the Verbal Reasoning Test and the Digit Symbol Test. The same Digit Symbol Test was administered at the two experimental sessions. Since scores at the second session were significantly higher compared to the first session, some of the analysis required a transformation of all scores to a single distribution.

An attempt was made to build two equivalent Space Relations Subtests by using two consecutive questions at a time on each

subtest. The Verbal Reasoning Subtests were formed by using odd numbered questions on one subtest and even numbered questions on the other. The Verbal Reasoning Subtests proved to be equivalent, i.e., the means and standard deviations of the two subtests did not differ. The scores on the Space Relations Subtests were transformed into a single standard distribution in order to make them statistically equivalent, since one of the tests had 40 possible correct answers and the other had 34 possible correct answers. (Both tests had the same number of questions, but questions differed in the number of possible correct answers). Except for the reduced time limits on the Space Relations and Verbal Reasoning Subtests, the administration and scoring of the subtests was done according to instructions provided in the respective manuals (5,9). At the end of the second session, the subjects filled out a funnel type postexperimental questionnaire (22) designed to uncover any suspicions they might have regarding the purpose of the experiment. Subjects were then debriefed, with the purpose of the research explained.

Determination of Menstrual Phases

During debriefing, female subjects were asked to inform the experimenter when the onset of their next menstruation occurred. Subjects were also asked to indicate the onset of their last period to determine those subjects who were menstruating during the experimental sessions.

For purposes of data analysis, women who were not taking oral contraceptives were defined as at mid cycle during days 13, 12, 11, 10, 9, 8 and 7 counting backwards from menstruation onset. No evidence of actual ovulation was gathered. However, if any

women present in the data were not ovulating, they would only add error variance to the final results. Premenstrual days were defined as days 5, 4, 3, 2, and 1 prior to menstruation; if subjects began menstruating after participating in the study on day 0 (i.e., the day of the experiment) they were also classified as premenstrual. Subjects were classified as menstruating if they were in days 1, 2, 3, or 4 following menstruation onset, or if they participated in the study on day 0 after beginning menstruation. The rationale for these classifications is given in Englander-Golden et al. (11).

Determination of Symptomatology and Contraceptive Use

Females filled out the symptomatology questionnaire for several phases of the menstrual cycle at the beginning of the debriefing session. The symptoms reported were cramps, headaches, weight gain, physical tension, crying spells, lump-in-the-throat, depression, and "tight band" around the head. Each symptom was judged on a 4-point scale. The PM symptomatology score was composed of the sum of the premenstrual and menstrual scores. The high and low symptomatology groups were formed by a median split on the premenstrual-menstrual symptomatology scale. Information about use of contraceptives was obtained at the end of the debriefing session. Subjects were assured anonymity.

RESULTS

At the first session 84 females participated. Of these, only 78 participated in the second session, where it was ascertained that only 55 females were not taking oral contraceptives. Of these

55 females one was pregnant, one was a foreign student with language difficulties, and one was told about the experiment by a friend; thus, the female group not taking oral contraceptives was reduced to 52. The RS score for one of these subjects could not be found. An attempt was made to determine why the other six females did not return for the second session. It was found that one had pneumonia, one had the flu, one was a nurse on call in a local hospital, an three subjects could not be found. Of the 23 females taking oral contraceptives, only 20 had available RS scores. Of the 25 males who participated in the first session, 22 returned to the second session.

Due to the small number of females taking oral contraceptives, the following analysis is limited only to females not taking oral contraceptives. Both the symptomatology and the repression-sensitization dimensions were established by dividing subjects according to a median split. The scores on the two Space Relations Subtests were transformed into a single distribution with a mean of 24.14 and standard deviation of 8.40. The scores on the Digit Symbol Test for both experimental sessions were transformed to a single distribution with a mean of 72.93 and standard deviation of 10.02. This transformation was needed since scores on the Digit Symbol Test were significantly different at the two experimental sessions ($t=4.28$, $df=43$, $p<.01$).

Each subject appears only once in the analysis of variance. However, some females were in two different menstrual phases at the two experimental sessions; only one of their scores was used. When a choice had to be made, it was always the midcycle score that was dropped, since midcycle cells had more data than premenstrual

or menstrual cells.

A 3 x 2 factorial analysis of variance (with RS and premenstrual, menstrual and midcycle phases of the menstrual cycle as the two independent variables) indicated an interaction effect of phase by RS for the Space Relations Test with poorest performance for the menstruating repressor group ($F(2, 38) = 4.72$, $p < .02$). As indicated in Table 1, that decrement in performance was striking.[3] A decrement in performance for the premenstrual repressor groups was not found. A similar analysis for the Verbal Reasoning Test indicated significant main effect for phase ($F(2, 38) = 3.63$, $p < .05$) with poorest performance for the menstruating group, and an interaction effect of phase by RS ($F(2, 38) = 3.63$, $p < .03$) with poorest performance again by the menstruating repressor group. Significant results for the Verbal Reasoning Test were not predicted. Congruent with prediction, a similar analysis yielded no significant results on the Digit Symbol test.

Insert Table 1 about here

Substituting high-low symptomatology for RS in the 3 x 2 factorial analysis of variance yielded a significant main effect for phase only on the Verbal Reasoning Test ($F(2,39) = 3.29$, $p < .05$) with the menstruating group showing poorest performance.

To compare the performance of females, females taking oral contraceptives and males, the scores obtained by each subject at the two experimental sessions were averaged for each test.

[3] Although no formal analysis was made of this subgroup of females with respect to academic performance in general, it is important to note that none of these females were among the highest performers on either the Space Relations or the Verbal Reasoning Tests at other times of their menstrual cycle.

Although the above groups did not differ significantly on any of the three tests, the differences in intellectual performance quoted in the literature were corroborated by the trends in the present data. On the average, males obtained scores of 26.86 on the Space Relations Test, 11.89 on the Verbal Reasoning Test, and 70.57 on the Digit Symbol Test. The corresponding scores for females taking oral contraceptives were 25.25, 11.40 and 72.05. Females not taking oral contraceptives scored 24.14, 11.23 and 73.7 on the respective tests.

DISCUSSION

By having subjects take the three tests twice, at a 2 week interval, it was assumed that for most of the females the two sessions would occur at significantly different points of their menstrual cycle. To the extent that in some females a repressive defensive style may be coupled with a feeling of threat or negative affect toward menstruation, it was hypothesized that these females would perform poorly on the Space Relations Test when either a threat or a negative affect arousing stimulus, i.e., menstruation, is salient. Although menstruation should be most salient while it is in progress, many women are aware of the onset of menstruation prior to its occurrence. Therefore, our hypothesis was that both premenstrual and menstruating repressors would suffer a decrement in performance on such a test. This hypothesis received confirmation only with respect to the menstruating repressor group who showed the poorest performance on the Space Relations Test when compared to premenstrual or mid cycle repressors or all female sensitizers. The fact that no significant differences were found on the Digit Symbol Test supports the interpretation that repression

will interact with menstruation to reduce performance primarily for complex tasks as indicated by the spatial and verbal tests. Of course the hypothesis only predicted such an interaction for the Space Relations Test. The data indicating significance on both complex tests, however, suggest that repression may interact with menstruation to adversely affect performance on any complex task.

The relationships obtained in the present experiment in which suspicion by subjects concerning any aspect of the major hypotheses was apparently nonexistent, suggest a reactive nature of repression. If this interpretation is correct, then experiments designed to investigate relationships between Repression-Sensitization and intellectual functioning will have to make the appropriate threat or negative affect salient to the subjects. Results such as those reported by Clark and Neuringer (23) in a study where sensitizers were not found to significantly exceed repressors on any of their measures of intellectual performance, could be due to the neutral condition under which the study was performed. A further problem that needs to be clarified is the use of a median split in the definition of repressors and sensitizers as compared to the use of extreme scorers, as was done by Clark and Neuringer (23)

To the extent that physical discomfort or some other physiological-hormonal concomitants of the menstrual cycle may dispose changes in intellectual performance across the menstrual cycle, it was hypothesized that it would be the high premenstrual-menstrual symptomatology females who would suffer a decrement in performance on the Space Relations Test premenstrually and during menstruation. No significant differences were found as a function of sympto-

matology for the Space Relations or Digit Symbol Tests. However, the Verbal Reasoning Test reached significance, indicating poorest performance for the menstruating groups as a whole, irrespective of the high-low symptomatology variable.

Although a reactive nature of repression was suggested in the present experiment, a mechanism by which such a defense mechanism might affect intellectual performance was not investigated. However, results reported by Rodin (24) suggest that reattribution could be such a mechanism. Rodin concluded that if menstruating women attributed distress to symptoms of menstruation, they performed better than equally distressed non-menstruating women and as well as women who were not distressed.

It is quite congruent to hypothesize that it is the sensitizer who is more capable of reattributing her arousal to symptoms of menstruation compared to the repressor. The latter would be reluctant to engage an anxiecy provoking stimulus which could be represented by menstruation for some women.

A direct comparison between the two female groups and the male group showed no significant differences on any of the three tests. However, the trends in the present data reflect differences in intellectual performance quoted in the literature (1-5, 7).

Results presented in Table 1 indicate that sex differences in intellectual performance may arise due to the poor performance of a subgroup of women, rather than due to some global pervasive and stable sex differences in intellectual functioning. Further research is necessary to investigate similar relationships for women taking oral contraceptives as well as the possible relationship between repression and attribution.

SUMMARY

It was hypothesized that some of the sex differences in intellectual performance quoted in the literature could arise due to a temporary decrement in performance suffered by a subgroup of women, rather than due to pervasive and stable sex differences in intellectual functioning. For this purpose tests were selected on which sex differences have been reported, namely the Space Relations Test and the Verbal Reasoning Test (both from the Differential Aptitude Tests) and the Digit Symbol Test (taken from the WAIS and considered a simple, repetitive task). A direct comparison between women not taking oral contraceptives, women taking oral contraceptives and men corroborate the general findings quoted in the literature, i.e., women not taking oral contraceptives have lowest scores on the complex tests and highest scores on the simple test. Performance of women taking oral contraceptives falls between that of women not taking oral contraceptives and men. The differences among the three subject groups were not significant, but the trends were consistent.

To test the hypothesis pertaining to a temporary decrement in performance by a subgroup of women not taking oral contraceptives, the above tests were administered to menstruating, premenstrual and mid cycle women who were identified as repressors or sensitizers and high or low in premenstrual-menstrual symptomatology. Results indicated that the major decrement in performance on complex tests was suffered by menstruating repressors. It was suggested that such a subgroup of women may lower the normative scores obtained by women as a whole, thus giving rise to the observed sex differences. It was suggested that repression is engaged mainly under conditions of threat. Furthermore, it was

suggested that a possible mechanism by which repression may exercise its detrimental effects is the inability of a menstruating repressor to attribute her anxiety to menstruation.

Further research, with larger samples, is needed to do a longitudinal analysis of performance both for women who are and who are not taking oral contraceptives. Finally, research needs to be done with male repressors when conditions of both threat and attribution are manipulated.

REFERENCES

1. Maccoby EE, Jacklin CM: The Psychology of Sex Differences. Stanford, Stanford University Press, 1974

2. Hutt C: Males and Females. Baltimore, Penguin Education, 1972

3. Sherman JA: Problem of sex differences in space perception and aspects of intellectual functioning. Psych Rev 74: 290-299, 1967

4. Broverman DM, Klaiber EL, Kobayashi Y, Vogel W: Roles of activation and inhibition in sex differences in cognitive abilities. Psych Rev 75: 23-50, 1968

5. Bennett GK, Seashore HG, Wesman AG: A Manual for the Differential Aptitude Test. New York, The Psychological Corporation, 1952

6. Parlee MB: The premenstrual syndrome. Psych Bull 80: 454-465, 1973

7. Sommer B: Menstrual cycle changes and intellectual performance. Psychosom Med 34: 263-269, 1972

8. Watson G, Glaser MG: Watson Glaser Critical Thinking Appraisal. New York, World Book Company, 1952

9. Wechsler D: Manual for the Wechsler Adult Intelligence Scale. New York, Psychological Corporation, 1955

10. Byrne D: The repression-sensitization scale: rationale, reliability, and validity. J Personal 29: 344-349, 1961

11. Englander-Golden P, Willis KA, Dienstbier, RA: Stability of perceived tension as a function of the menstrual cycle. Submitted to J Human Stress, July, 1976

12. Witkin HA, Lewis HB, Hertzman W, Machover K, Brettnall-Meissner P, Wapner A: Personality through Perception. New York, Raven Press, 1975

13. Hamburg DA, Hamburg BA, Barchas JD: Anger and depression in perspective of behavioral biology, in Levi L, Emotions. New York, Raven Press. ;975

14. Klaiber EL, Kobayashi Y, Broverman DM, Hall F: Plasma Monoamine oxidase activity in regularly menstruating women and in amenorrheic women receiving cyclic treatment with estrogens and a progestin. J Clin Endocrinal Metab 33: 630-638, 1971

15. Bardwick JM: Psychology of Women: A Study of Biocultural Conflicts. New York, Harper & Row, 1971

16. Lazarus RS, Averill JR, Opton EM: The psychology of coping: issues of research and assessment, in Coelho GV, Hamburg DA, Adams JE, Coping and Adaptation. New York, Basic Books, 1974

17. Spielberger CD: Effects of anxiety on complex learning and academic achievement, in Spielberger CD, Anxiety and Behavior. New York, Academic Press, 1966

18. Holzman PS, Gardener RW: Leveling and repression. J. Abnorm Soc Psych 59: 151-1555, 1959

19. Messick S: The impact of negative affect on cognition and personality, in Tomkins SS, Izard CE, Affect, Cognition and Personality. New York, Springer Publishing Company, 1965

20. Witkin HA, Dyk RB, Faterson HF, Hanna F. Goodenough DR, Karp SA: Psychological Differentiation. New York, Harper Brothers, 1954

21. Wong S, Tong JE: Menstrual cycle and contraceptive hormonal effects on temporal discrimination. Perceptual and Motor Skill 39: 103-108, 1974

22. Page M: Postexperimental assessment of awareness in attitude conditioning. Edu Psych Meas 31: 891-106, 1971

23. Clark LF, Neuringer C: Repressor-sensitizer personality s styles and associated levels of verbal ability, social intelligence, sex knowledge, and quantitative ability. J Consult Clin Psych 36: 183-188, 1971

24. Rodin J: Menstruation, reattribution, and competence. J Personal Soc Psych 33: 345-353, 1976

Table 1

Means on Performance Tests and Number of Subjects

by Condition for Women and Men

Menstrual Phase	Space Relations				Verbal Reasoning				Digit Symbol			
	Sensitizers		Repressors		Sensitizers		Repressors		Sensitizers		Repressors	
Premenstrual	24.57	(7)	28.20	(5)	12.43	(7)	13.20	(5)	76.86	(7)	75.20	(5)
Menstrual	26.59	(7)	13.89	(8)	11.71	(7)	7.63	(8)	79.36	(7)	70.51	(8)
Mid cycle	23.49	(9)	27.38	(8)	11.00	(9)	13.13	(8)	73.42	(9)	71.81	(8)
Men[a]	26.89	(14)	26.81	(8)	11.57	(14)	12.44	(8)	69.53	(14)	72.38	(8)
Pill Women[a]	23.36	(7)	26.27	(13)	11.00	(7)	11.73	(13)	69.86	(7)	73.50	(13)

[a]Sensitizers and repressors were defined on the basis of a median split. Scores of 41 or above were considered sensitizers and 40 or below were repressors.

The male scores appearing in the table, as well as those of women taking oral contraceptives, are averages of the two scores for each subject obtained at the two experimental sessions.